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FLEET NUMERICAL WEATHER CENTRAL MONTEREY CA
THE FNWF OCEAN HISTORY INFORMATION RETRIEVAL SYSTEM (FOHIRS). (U)
APR 68 G M GRISWOLD, W C WOODWORTH

F/G 4/1

UNCLASSIFIED

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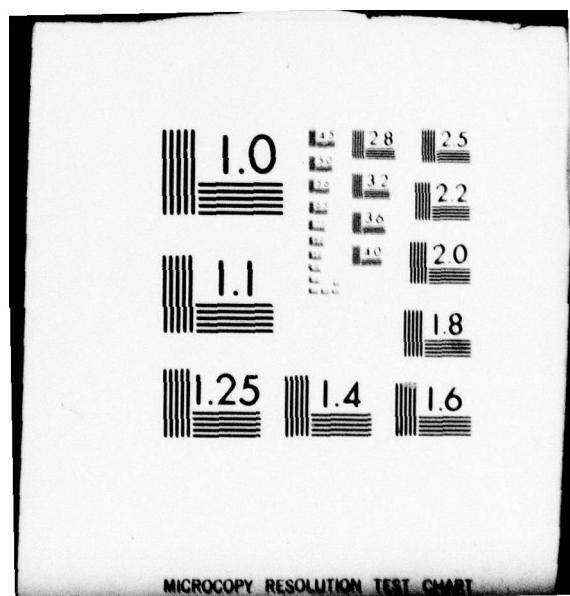
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THE
FNUF OCEAN HISTORY INFORMATION

RETRIEVAL SYSTEM

POINTER

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FLEET NUMERICAL WEATHER PREDICTION
MONTEREY, CALIFORNIA

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Abstract

1. INTRODUCTION

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The Fleet Numerical Weather Facility Ocean History Information Retrieval System (FOHIRS) is an automated digital file of oceanographic data designed for the needs of FNWF. It is an extension and refinement of the FNWF Historical Ocean and Ocean Climatology automation program and was designed primarily to satisfy support requirements for ASW forecasts and exercise reconstructions. In addition to its operational applications, it can be of considerable value to research oceanographers who require historical oceanographic data.

The principal input to FOHIRS is some 65 years of Nansen cast station data obtained from the National Oceanographic Data Center. To this base are added bathythermograph data, ocean summaries, and hand extracted marine geophysical survey data, each identified by its source code. This technical note outlines the status and coverage of the data to date. A brief description and listing of the computer programs with examples of the data output formats are included.

Abstract

2. PURPOSE

The FOHIRS system was evolved to assist in producing climatology for the world's oceans which will allow a more accurate and rapid response to fleet requests for ASW forecasts. Temperature and salinity profiles for underwater sound propagation calculations initially were extracted from cruise reports, expedition tabulations, atlases or other published data. This is a time consuming, subjective procedure and obtaining representative soundings from reams of individual observations is not always possible.

To provide prompt and accurate ASW forecasts, time averaged climatological fields of temperature and salinity are needed for all the world's oceans from the surface to the bottom (monthly from the surface to 150m; seasonal from 150 to 600m; and annual from 600m to the bottom). As

these are not readily available in numerical formats which allow rapid retrieval for individual points, it was decided to use NODC data as a base and develop programs to manipulate these data.

3. DEVELOPMENT

The FOHIRS system of programs was originally developed for the CDC 3200 computer. Programs were written to convert a variety of input formats into a standard FOHIRS binary format which could then be inventoried, summed, or otherwise manipulated to provide the desired output.

The processing of data began early in 1967 with the purchase of seven magnetic tapes of Western Atlantic data from NODC. An additional 27 tapes purchased from NODC expanded the coverage to the entire Pacific. Four tapes were obtained from NAVOCEANO to supply data for the Eastern Atlantic and Mediterranean areas. Statistical data derived from Nansen casts were obtained from the Naval Air Development Center, Johnsville, Pennsylvania, for some ten Marsden Squares in the Western Atlantic.

With the acquisition of a CDC 6500 by FNWF, the programming emphasis was shifted to the faster, more versatile machine. In March of this year, 53 tapes were purchased from NODC representing their entire file of oceanographic observations for the northern hemisphere which had been processed to that date. These tapes have been packed into 13 tapes by converting the BCD format to the FOHIRS binary format. These tapes are being further processed into two basic files, one will consist of only those soundings which extend to a depth greater than 300 meters, and the other will include all soundings of 300 meters or less. The object of this division is to minimize the retrieval time for deep ocean data.

Twice daily FNWF analyzes eight levels of the ocean from the surface to 1200 feet. If information on the first 1200 feet of the oceans is required, the data are extracted from the current analyses or from the

corresponding monthly climatology fields. The deep sounding file will allow the most rapid access to the information required to depths beyond 1200 feet. The shallow sounding file will provide an ever expanding base for improving the climatology fields for the oceanographic analyses.

4. FUTURE PLANS

The two data files will be maintained by adding new data as they are acquired. Hand-extracted or taped Magnetic-Geophysical-Survey data will be processed and merged into the present files as it becomes available. FNWF has begun digitizing expendable bathythermograph traces in cooperation with NODC for inclusion in the corresponding files. Oceanographic data used in the daily analyses at FNWF and additional data processed by NODC will also be added to these files periodically.

To further minimize acquisition time, these files will be divided into specific areas, i.e.: North Atlantic, East Atlantic, West Atlantic, Mediterranean, etc. These tapes will be provided to each fleet weather central for their areas of responsibility along with the CDC 3100 programs to manipulate these data. Updated tapes will be provided periodically to keep these files current.

The processed file data will be used to develop climatological fields for all levels of all the world oceans. Summaries for each one-degree square of latitude and longitude will be used in conjunction with published atlases to provide an accurate and current climatology. In preparing the climatological fields, emphasis is placed on the construction of average, rather than mean, fields, i.e.: maintaining the gradients as they occur under normal synoptic conditions and placing the "fronts" in their mean position according to the time period.

5. FOHRS PROGRAMS

The basic file building computer programs are called NODCBIN, SPOTBIN,

and BINPACK. NODCBIN is designed to process NODC data and SPOTBIN for FNWF collected data. BINPACK is designed to process NAVOCEANO BCD and packed binary (Yergen format) data. All programs output data in the standard FOHIRS single sounding per record binary format. Each program has an option to print an inventory of processed data by Marsden Squares and month.

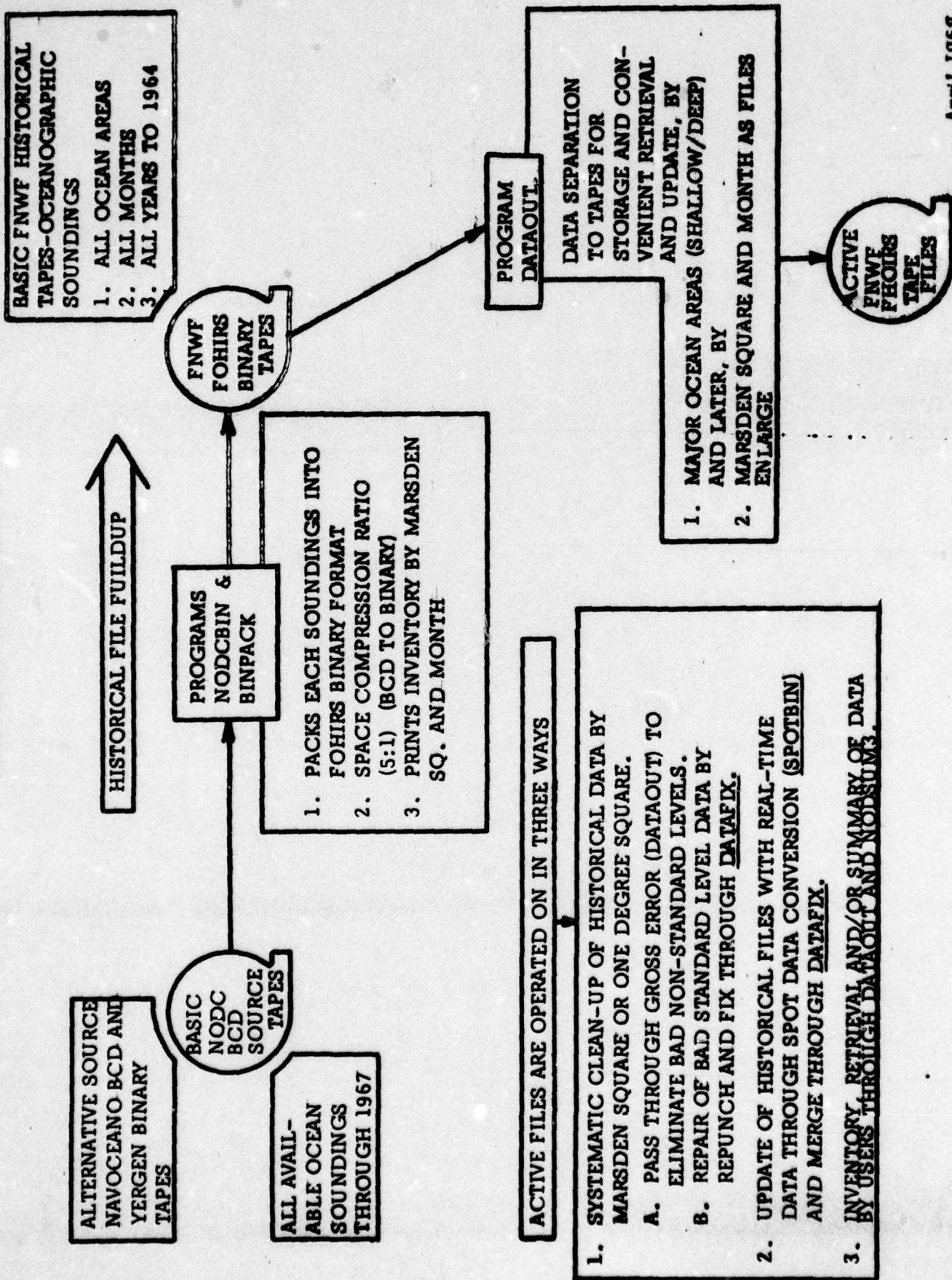
Data is further processed (Figure 1) through the DATAOUT program, which copies selected data onto an output tape and/or prints hydrocast station data by Marsden Square, Lat/Long Coordinates, Month(s), Minimum or Maximum Depths, or subsequent to a specific selected year. A gross error option may be selected which calculates σ_t values for each level and rejects any soundings with negative gradients greater than 0.05. Rejected data is written onto the output tape in a corrected form if one of the rejected levels is a non-standard level, uncorrected if not, and the sounding printed out if so desired. These soundings may then be corrected by an oceanographer and reinserted into the file by the DATAFIX program (Figure 2).

FNWF real-time data will be added to the active files through the process indicated in Figure 3. Program SPOTBIN provides the capability of adding the increasingly large numbers of real-time BT, XBT (digitized at FNWF) and aboard ship), and hydrocast data directly to FOHIRS files eliminating the large time lag in the present system. Data is sorted by program BINSORT by one-degree squares for insertion in the FOHIRS active file. NODC data will continue to be added to the files in the same manner. Thus, FOHIRS is a dynamic system which will continue to expand as new data is processed and incorporated into the files.

The present retrieval capability of FOHIRS programs provides tapes in FOHIRS binary format or printouts of (a) individual complete soundings; (b) heading inventories; or (c) summarized data (Figure 4).

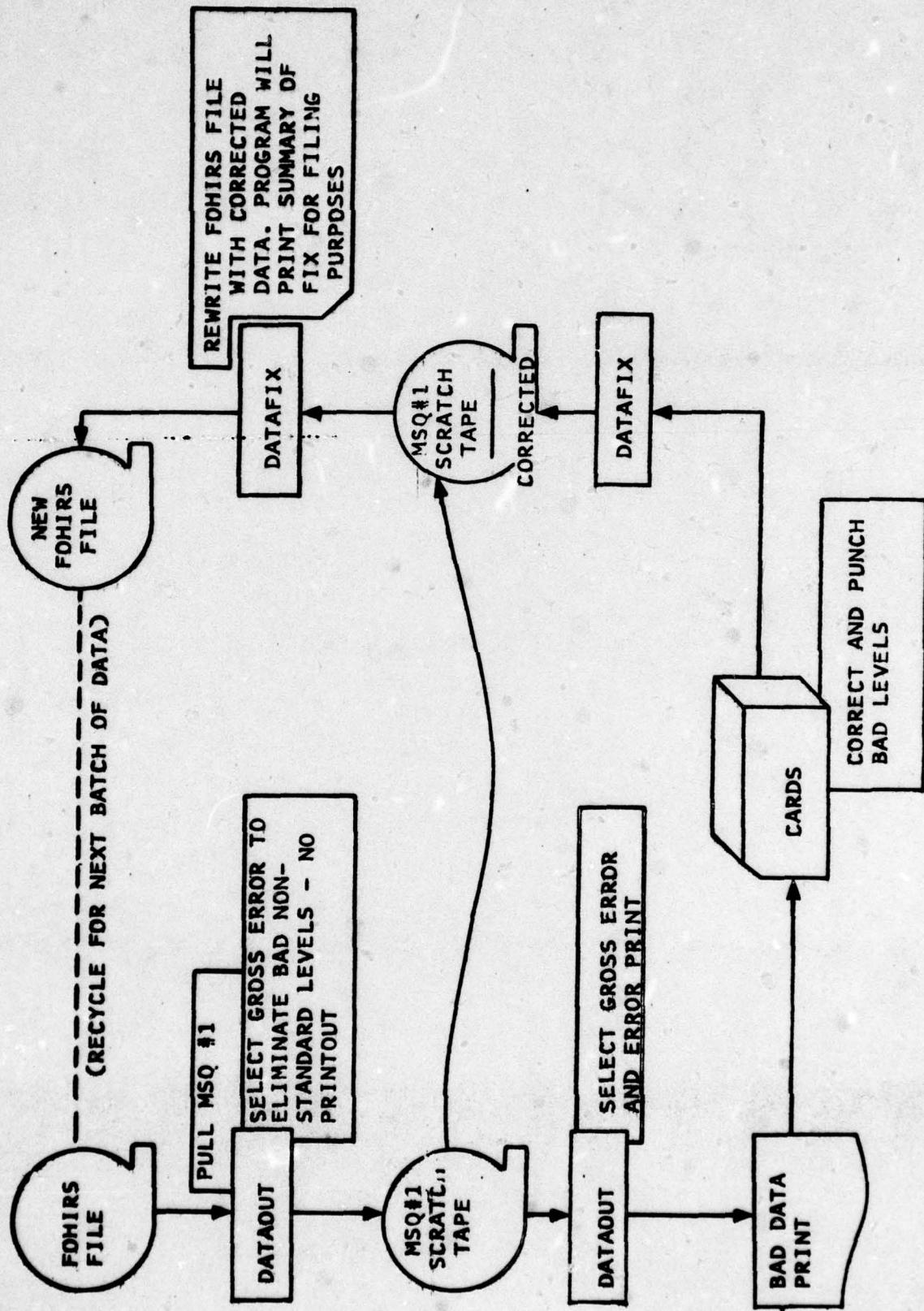
Program DATAOUT is the general purpose data retrieval program of the FOHIRS system on the CDC 6500. A program called NODCOUT performs similar functions on the CDC 3200 computer. DATAOUT writes

CDC 6500 FOHRS SYSTEM



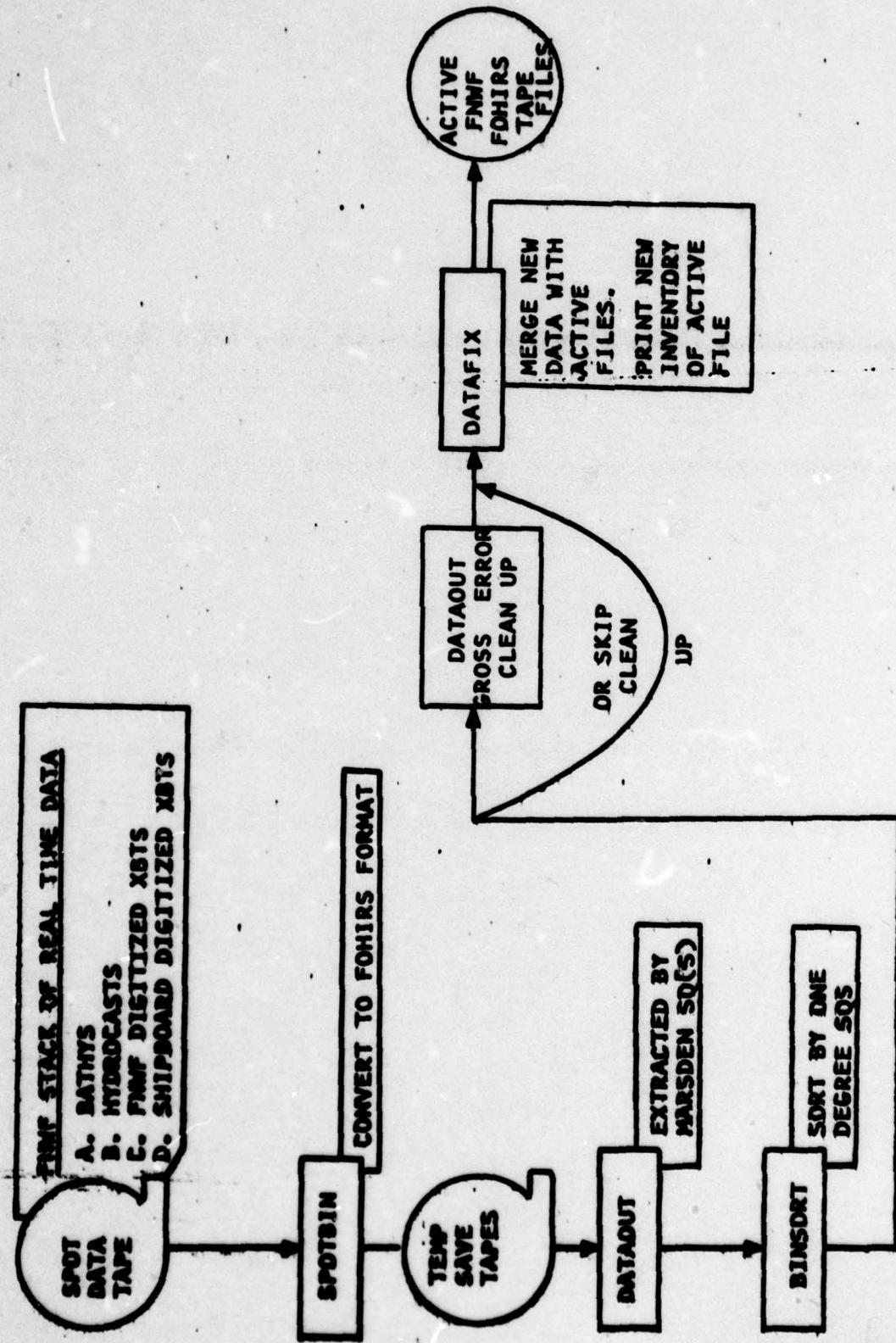
April 1968

SCHEMATIC OF ACTIVE FILE OPERATION - FOHIRS
OPERATION 1 (EXAMPLE)



FOHIIS OPERATION 2 (EXAMPLE)

UPDATE CYCLE



FOHRS OPERATION 3 (EXAMPLES)

RETRIEVAL/SUMMARY

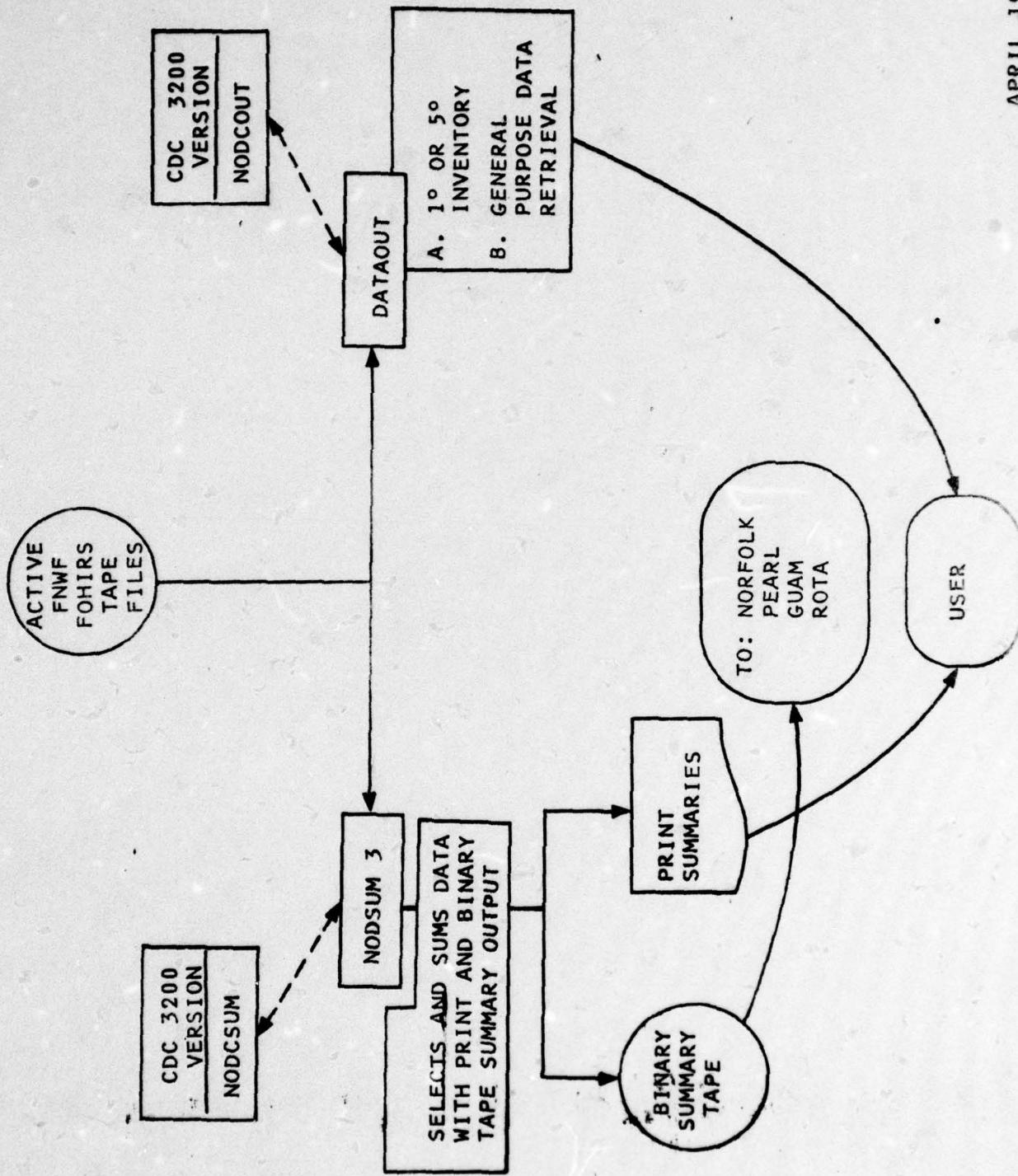


FIGURE 4

APRIL 1968

magnetic tapes in the FOHIRS binary format or prints data in FOHIRS formats 52, 53, 54, or 55 (see Appendix).

Program NODSUM3 is the basic program for producing summaries of Nansen cast data on the CDC 6500 computer. NODSUM3 selects data by one-degree lat/long squares specified by the user, averages the data at each level and outputs to tape or prints in formats 56 and 57. These formats provide average values, standard deviations, minimum and maximum temperatures and salinities or sound velocities for each standard level. NODCSUM performs similar functions on the CDC 3200.

6. REQUESTS FOR OCEAN HISTORY INFORMATION

Requests for FOHIRS data, either summaries or soundings, should be forwarded to the Officer-In-Charge, U.S. Fleet Numerical Weather Facility, Monterey, California, via Commander, Naval Weather Service, Command, Navy Yard Annex, Washington, D.C.

Requests for printed data should specify the format(s) desired as well as the following:

1. The time period of interest; i.e., months, seasons, or annual data.
2. Area of interest; i.e., Marsden square number(s) or lat/long boundaries.
3. The minimum depth of interest (in meters preferred).
4. The maximum depth of interest (in meters preferred).
5. The start year (the earliest year of historical data to be extracted). Nansen cast soundings go back to 1900.

Requests for magnetic tapes should also include the above information.

The tapes will be in the standard FOHIRS binary format. Organizations requesting taped data should furnish the magnetic tapes. The NODC data tapes in BCD format may be copied but no extraction by time, area, or depth is possible.

7. SUMMARY AND CONCLUSIONS

Herein, we have described a dynamic historical ocean data file system designed for operational support of fleet operations in the oceans of the world. The primary users are intended to be FNWF, Monterey, and the Navy Weather Centers and Facilities of the Naval Weather Service.

Quality checking of the data, resorting, and reformatting has been relatively thorough, but no guarantee is made that all data is error free. Users are cautioned to be critical of the data and to advise FNWF when suspicious data is discovered. A major problem still remains in the summarizing of multimodal soundings in one-degree squares in areas of water mass boundaries.

Data coverage is admittedly insufficient in time and/or space in many areas of the oceans. Later cruise data and also MGS, BT, XBT, and AXBT observations will be added to these files on a regular basis thus reducing the lag time normally present in large data bank systems. This updating should contribute materially to the Navy's capability to better define the probabilities of occurrences of deep ocean characteristics and hopefully improve the predictability of deep temperature, salinity, and sound velocities.

Users of this ocean climatology data bank should be able to noticeably improve their support for marine operations. Each user can contribute to improving the effectiveness of the data bank by expediting new data for inclusion in the system and by constructively evaluating the information obtained. FNWF Monterey solicits any comments.

REFERENCES

1. NODC, Publication M-2, Manual Series, Processing Physical and Chemical Data From Oceanographic Stations, Part 1, Coding and Keypunching, 1964. 117 pages.
2. NODC, Inventory of Archived Data, Publication C-3, Catalog Series, 1966. 150 pages.
3. W.C. Woodworth and N.M. Stevenson, Deep Ocean Climatology File Project, Final Status Report, 20 July 1967, Navy Contract No. N00228-67-C-0842. 13 pages, on file at FNWF, Monterey.
4. Mellonics Division of Litton Systems, Inc., Deep Ocean Climatology and Sea State Project 1967-68, Final Report, 16 January 1968. 5 pages.
5. U.S. Naval Air Development Center, The Variations of Sound Velocity and Temperature in the North Atlantic, Volumes I and II, 1966. 70 pages each.

A P P E N D I X

FOHIRS INFORMATION AVAILABILITY

<u>Information</u>	<u>Program(s)</u>	<u>Tape</u>	<u>Print Format</u>
Inventories, by months, of the number of hydro-cast soundings available for any given Marsden Square(s).	SPOTBIN NODCBIN	X	51
Whole soundings which have been rejected by a gross-error check and indicating errors detected in vertical consistency.	DATAOUT DATAFIX NODCOUT		52
Inventories, by heading, of hydro-cast data for any given geographical area of interest, time period, maximum and minimum depths.	DATAOUT NODCOUT	X	53
Inventories, by years, of hydro-cast soundings, summed within a given one-degree lat/long area.	DATAOUT NODCOUT	X	54
Whole hydro-cast soundings selected by Marsden square, lat/long coordinates month or months, maximum or minimum depths, start year selection.	DATAOUT NODCOUT	X X	55
Summaries of temperatures and salinity values for standard depths in meters by one-degree lat/long squares.	NODSUM3 NODCSUM	X	56
Summaries of temperatures and sound velocity values for standard depths in meters by one-degree lat/long squares.	NODSUM3 NODCSUM	X	57
Inventories of sorted FOHIRS binary tapes listing, by one-degree squares, those soundings for a particular month, showing year, month, hour and lat/long position.	BINSORT	X	58

NODC FOHRS BINARY DATA TAPE 4235 PREPARED ON 03/04/68

ONE FILE OF 3172 HYDRO CASTS ON 488.9 FT OF TAPE CONTAINING FOLLOWING

MARS SQ	TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MAX DEPTH
1	621	5	66	162	73	35	8	21	23	65	89	79	2	5130
2	479	16	28	66	76	58	1	15	8	33	81	92	5	7600
3	151	0	33	28	16	12	3	10	15	11	22	1	0	5400
4	220	0	25	88	35	12	4	8	31	9	1	5	2	5300
5	321	1	27	52	42	24	56	7	19	23	13	39	18	4800
6	102	12	7	18	6	10	0	0	0	12	7	23	7	4700
7	10	0	0	8	0	0	0	0	0	0	0	2	0	100
8	192	10	22	87	6	8	4	7	4	7	5	21	11	3800
9	235	4	25	19	0	45	18	8	16	4	3	85	8	3500
10	55	0	0	0	0	8	10	0	8	4	11	10	4	3800
11	40	0	0	0	0	0	11	0	10	6	4	0	9	3200
12	45	1	1	0	0	8	1	0	0	8	23	3	0	4100
13	31	3	0	0	0	13	0	0	1	0	12	2	0	4600
14	43	0	0	3	4	7	11	0	6	8	3	6	0	4400
15	96	0	0	16	19	6	14	7	5	17	3	9	0	5300

FOHRS FORMAT 51

This is a sample output from program NODCBIN and SPOTBIN (CDC 6500). It is an inventory, by months, of the number of hydro-casts available for given Maraden Squares.

COSH	LAT	LONG	MSQYYMMDDHH
	2007	8138	815404 907

*** NON SEQUENTIAL DEPTH ***

DEPTH	TEMP	SALT	DENS	SOVEL	OXY	ERR
X1	X100	X100	X100	X10	X100	
	LISTED	VALUES	ARE	PRODUCTS	AS	INDICATED
0	2744				23.57	36.29
0	2744	3629	2357		23.57	-.13
10	2729				23.44	-.12
20	2709				23.32	-.08
30	2676	3557	2324	15400	23.25	35.57
50	2611	3611	2386	15395	23.86	36.11
75	2607	3640	2409	15401	24.09	36.40
100	2538	3662	2447	15392	24.47	-.27
100	2538	3626	2420		24.20	36.26
125	2360	3676	2511	15355	25.11	36.76
150	2208	3683	2560	15322	25.61	36.83
200	1985	3674	2615	15270	26.15	36.74
250	1850	3656	2636	15239	26.36	36.56
300	1732	3638	2651	15211	26.52	36.38
400	1466	3597	2681	15140	26.81	35.97
500	1222	3557	2701	15071	27.01	35.57
600	1012	3523	2713	15009	27.13	35.23
700	866	3501	2720	14969	27.20	35.01
700		3501			0.00	0.00
809	702	3490	2736	14921	27.36	34.90
900	519	3485	2756	14864	27.56	34.85
1000	503	3493	2764	14875	27.64	34.93
1100	468	3495	2769	14878	27.70	34.95
1200	444	3496	2773	14885	27.73	34.96
1300	437	3498	2775	14899	27.76	34.98
1400	430	3499	2777	14913	27.77	34.99
1500	423	3500	2778	14927	27.79	35.00
1550	420	3501	2779	14934	27.80	35.01

FOHRS FORMAT 52

This is a sample output of programs DATAOUT and DATAFIX (CDC 6500) and NODCOUT (CDC 3200) using the gross-error check option. Errors in vertical consistency are noted under column marked "ERR".

NODPRINT INVENTORY OF TAPE 4235

COSH	LAT	LONG	MSQYYMMDDHH	TYPE	BTM	MAX	DP	PROC	NR
31PL	408	1957	26309 410	NH	4413	32		0014	
31C1	548	1035	261032809	NH	140	1		0001	
900L	501	1000	263032903	NH	0	15		0001	
NILR	556	1011	264042408	NH	20	0		0093	
NILR	555	1013	264042409	NH	30	0		0094	
NILR	554	1014	264042412	NH	44	0		0095	
NILR	553	1015	264042415	NH	50	0		0096	
NILR	542	1022	264042508	NH	100	1		0097	
NILR	539	1025	264042510	NH	175	2		0098	
NILR	538	1025	264042514	NH	400	2		0099	
90ZV	502	1008	264073121	NH	0	15		0038	
90ZV	529	1011	26408 104	NH	0	5		0039	
90ZV	536	1013	26408 108	NH	0	1		0040	
NILR	556	1012	26311 506	NH	27	0		0123	
NILR	555	1009	26311 508	NH	20	0		0124	
NILR	555	1012	26311 509	NH	30	0		0125	
NILR	554	1013	26311 511	NH	40	0		0126	
NILR	552	1014	26311 515	NH	50	0		0127	
NILR	547	1018	26311 606	NH	70	1		0128	

FOHIRS FORMAT 53

This is a sample output from programs DATAOUT (CDC 6500) or NODCOUT (CDC 3200). It is an inventory, by headings, of hydro-cast soundings filed on FOHIRS Tape No. 4235. See glossary for definitions of columns.

AREA LIMIT

2400 - 2500N 8100 - 8200N

DEPTH	00-25		26-45		46	YEARS						INITIAL YEAR 1900		TOTAL/ DEPTH	
	00	25	00	25		60	61	62	63	64	65	66	67		
100M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
200M	0	0*	0	0	2	0	0	0	0	0	0	0	0	0	2
300M	0	0*	0	0	4	0	0	0	0	0	0	0	0	0	4
400M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
500M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
1000M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
1500M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
2000M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
2500M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
3000M	00	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
3500M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
4000M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
4500M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
5000M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
5000M	0	0*	0	0	0	0	0	0	0	0	0	0	0	0	0
TOT/YR	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0

FOHIRS FORMAT 54

This is a sample output from programs DATAOUT (CDC 6500) and NODCOUT (CDC 3200). It is an inventory by years of hydro-cast soundings summed within a given 1-degree lat/long area. Headings of soundings considered by DATAOUT are also listed in FOHIRS Format 51 (to a maximum of 25) for spot checking of precise position or time, etc.

COSH LAT LONG MSQYYMMDDHH TYPE BTM MAX DP PROC NR
 31JP 14 756 164032117 NH 0 2 0041
 DEPTH TEMP SALT DENS SOVEL OXY SPVOL DYN A METER
 LISTED VALUES ARE PRODUCTS AS INDICATED

X1	X100	X100	X100	X10	X100	X10*7	X1000
0	3004	3442	2130	15453		65000	0
0	3004	3442	2130	15453			
10	2988	3444	2136	15451		64400	65
20	2925	3445	2158	15440		62300	128
20	2925	3444	2158	15440			
25	2876	3460	2187	15432			
30	2730	3510	2272	15407		51500	185
30	2730	3510	2272	15407			
35	2654	3532	2313	15393			
39	2478	3561	2389	15356			
43	2412	3577	2421	15343			
46	2393	3592	2438	15341			
50	2366	3613	2462	15337		33500	270
50	2366	3613	2462	15337			
54	2265	3617	2494	15313			
58	2199	3617	2513	15297			
62	2112	3617	2537	15275			
66	2027	3612	2556	15253			
71	1984	3610	2566	15241			
75	1918	3603	2578	15223		22500	340
81	1830	3594	2594	15198			
100	1645	3572	2621	15144		18400	391
101	1636	3570	2623	15141			
125	1460	3549	2645	15088		16200	435
126	1456	3648	2646	15086			
150	1448	3546	2646	15087		16200	435
151	1447	3545	2646	15087			
176	1430	3544	2648	15086			
200	1419	3543	2650	15086		16000	556
201	1419	3542	2650	15086			

FOHIRS FORMAT 55

This is a sample output of a hydro-cast sounding from programs
 DATAOUT (CDC 6500) and NODCOUT (CDC 3200). See glossary
 for definition of heading and columns.

SALINITY AND TEMPERATURE SUMMARIES OF NANSEN CASTS

TAPE NO. 4953

DATE 10/02/68

PAGE 39

MARS SQ. 81 ONE DEG SQ 86 LAT 28.30 LONG 38.30 MONTH 6

SALINITY TEMPERATURE

	NO	AVG	SD	MAX	MIN	NO	AVG	SD	MAX	MIN
0	3	34.41	.60	35.26	33.96	3	27.27	.51	27.98	26.83
10	3	35.27	.20	35.44	34.99	3	25.73	.96	27.08	24.99
20	3	35.81	.21	36.01	35.53	3	24.53	1.34	26.39	23.30
30	3	36.10	.23	36.37	35.81	3	23.47	.89	24.67	22.54
50	3	36.33	.07	36.41	36.25	3	21.81	.36	22.29	21.42
75	3	36.42	.03	36.46	36.38	3	20.59	.64	21.32	19.76
100	3	36.42	.07	36.49	36.33	3	19.37	.71	20.08	18.40
125	3	36.39	.12	36.52	36.23	3	18.06	.61	18.53	17.20
150	3	36.32	.16	36.51	36.12	3	16.83	.63	17.46	15.97
200	3	35.98	.09	36.06	35.85	3	14.85	.60	15.45	14.04
250	3	35.56	.12	35.68	35.44	2	12.96	.41	13.38	12.55
300	2	35.38	.12	35.51	35.26	2	11.60	.36	11.96	11.24
400	2	35.19	.08	35.27	35.11	2	9.50	.34	9.85	9.16
500	0	0.00	0.00	0.00	0.00	1	7.78	0.00	7.78	7.78

- FOHRS FORMAT 56

This is a sample output from programs NODSUM3
 (CDC 6500) and NODCSUM (CDC 3200). These are
 summaries of salinity and temperature values by
 one-degree lat/long squares.

SOUND VELOCITY AND TEMPERATURE SUMMARIES OF NANSEN CASTS

TAPE NO. 4953

DATE 10/02/68

PAGE 10

MARS SQ 81 ONE DEG SQ 40 LAT 24.30 LONG 80.30 MONTH 6

DEPTH	SOUND VELOCITY					TEMPERATURE				
	NO	AVG	SD	MAX	MIN	NO	AVG	SD	MAX	MIN
0	16	1542.7	1.1	1544.2	1540.7	16	27.93	.50	28.58	26.89
10	16	1542.5	1.3	1544.3	1539.0	16	27.75	.62	28.57	26.03
20	16	1542.1	1.6	1544.0	1537.2	16	27.46	.76	28.36	25.23
30	16	1541.2	1.8	1543.0	1535.5	16	26.94	.84	27.81	24.42
50	16	1539.2	2.6	1541.7	1532.1	16	25.91	1.11	27.04	22.93
75	16	1536.5	4.2	1540.7	1528.5	16	24.59	1.73	26.35	21.33
100	16	1533.6	6.0	1539.3	1522.4	16	23.23	2.34	25.52	18.95
125	16	1528.9	9.1	1538.8	1507.2	16	21.31	3.24	25.13	14.01
150	15	1525.3	10.8	1536.4	1501.1	15	19.88	3.60	23.85	12.15
200	13	1522.6	5.8	1530.7	1508.8	13	18.47	1.90	21.31	14.09
250	12	1519.3	4.9	1524.7	1509.1	12	17.08	1.54	18.84	13.97
300	11	1515.7	4.4	1520.8	1508.0	11	15.71	1.32	17.26	13.40
400	11	1506.9	3.8	1513.6	1500.3	11	12.63	1.07	14.56	10.83
500	10	1498.8	2.9	1503.2	1494.8	10	9.99	.76	11.17	8.93
600	9	1493.7	3.9	1498.6	1484.6	9	8.26	.99	9.50	5.95
700	9	1490.3	3.2	1495.4	1484.1	9	6.97	.81	8.25	5.42
800	5	1488.2	1.6	1490.6	1485.5	5	6.02	.41	6.63	5.35
900	1	1487.9	0.0	1487.9	1487.9	1	5.54	0.00	5.54	5.54

FOHIRS FORMAT 57

This is a sample output from programs NODSUM3 (CDC 6500) and NODCSUM (CDC 3200). These are summaries of sound velocity and temperature values by one-degree lat/long squares.. Format is the same as 56 except for substitution of sound velocity for salinity.

MSQ	TOTAL
86	8
87	8
122	8
123	8

TAPE INVENTORY FOLLOWS

MSQ	DEG	SQ	MONTH	YYMMDDHH	LAT	LONG
86		99	8	65081123	2950	13925
86		99	8	65081206	2950	13949
86		99	8	65081321	2929	13949
86		99	8	65081408	2928	13929
86		99	8	65082117	2951	13928
86		99	8	65082201	2952	13950
86		99	8	65082305	2930	13949
86		99	8	65082311	2930	13926
MSQ	DEG	SQ	MONTH	YYMMDDHH	LAT	LONG
87		90	8	65081214	2949	14014
87		90	8	65081221	2950	14035
87		90	8	65081304	2929	14031
87		90	8	65081314	2929	14015
87		90	8	65082205	2950	14015
87		90	8	65082214	2950	14039
87		90	8	65082217	2929	14036
87		90	8	65082223	2930	14012
MSQ	DEG	SQ	MONTH	YYMMDDHH	LAT	LONG
122		9	8	6508 917	3024	13937
122		9	8	6508 920	3030	13949
122		9	8	65081105	3010	13950
122		9	8	65081113	3010	13925
122		9	8	65081914	3021	13938
122		9	8	65081923	3030	13951
122		9	8	65082104	3010	13948
122		9	8	65082114	3008	13925

FOHIRS FORMAT 58

This is a sample output from program BINSORT (CDC 6500).
 This is a tape inventory of binary FOHIRS soundings sorted
 by BINSORT in (1) ascending order of marsden squares and
 then (2) by ascending order of one-degree squares.

A Glossary of Contractions/Abbreviations Used in FOHIRS Outputs

BTM	= Depth of bottom in meters
COSH	= Country/ship code
DD	= Day
DENS	= Sea water density expressed in sigma-t to hundredths (g/l-1000). See NODC Manual M-2 for further definition.
DEPTH	= Depth in whole meters
DYNA-METER	= Dynamic depth anomaly - whole meters
HH	= Hour
LAT	= Latitude
LONG	= Longitude
MAX DP	= Maximum depth of sounding in hundreds of meters
MSQ	= Marsden square number
NO	= Number of soundings considered in any given summary
OXY	= Oxygen expressed in milliliters per liter to hundredths. See NODC Manual M-2 for further definition..
PROC NO	= NODC identification number (left four digits of process number)
SALI	= Salinity expressed as parts per thousand to two decimal digits
SD	= Standard deviation
SND VEL	= Sound velocity expressed in tenths of meters/second
SOVEL	= Sound velocity expressed in tehths of meters/second
SPVOL	= Specific volume anomaly X10 ⁷
TEMP	= Temperature in degrees and hundredths centigrade
TYPE	= Source/type code (external)BCD)* see below
YY	= Year (from 1900)

Source/Type Code

1st Letter (Source)

N = NODC
M = MGS
F = FNWF
Y = YERGEN
O = NAVOCEANO
B = BCF
S = SHIPBOARD

2nd Letter (Type)

H = Hydrocast
B = BT
X = XBT
A = AXBT

STANDARD FOHIRES TAPE FORMAT

1. Tape output is in standard FOHIRES binary single cast/per record format (60 bit word).
2. HEADER-IDENT/FORMAT (10-24 bit words/4-60 bit words)

Word 1

0	24	48	60
Maraden Square	Year/Month	Day	

Word 2

0	12	36	60
Hour	4-Digit Integer Lat-Deg/ Min	4-Digit Integer Long-Deg/ Min	

Word 3

0	24	48	60
Country/Ship Code (Ext BDC = 4 Char)	Source and Type of Data (Ext BCD-2 Char)	Cast Depth (Left 12bts)	

Word 4

0	12	36	60
Cast Depth (Right 12 bits)	Bottom Depth (Meters)	NODC Ident No.	

3. DATA-IDENT/FORMAT (8 parameters, 5-24 bit words/2-60 bit words per level).

Word 5

0	24	36	48	60
Depth in Whole Meters	Temp x 100-2000 (Anomaly) Deg C	Sali x 100 Parts/1000	Snd Vel x 10-1500 (Anomaly) MPS	

Word 6

0	12	24	36	60
Dens x 100 GMS-Lit- er-1000	Oxy x 100 ML/L	SpoVol/100 GM/CM ³	Dynamic Anomaly DynaMeters x 10 ³	

STANDARD BINARY SUMMARY OUTPUT TAPE FORMAT

1. The FOHIRS binary summary record is a 2-record tape format, one heading ident and a variable length data record. (Anomalies are same as in format shown on page 23).
2. Record 1 - HEADER IDENT/FORMAT (4-60 bit words)

WORD 1

0 60
[BCD Chars Left ADJ, Blank Fill Right]

WORD 2 Monthly or Seasonal Sums

0 60
[0/1]

WORD 3 Temp with Salinity (0) with Sound Velocity (1)

0 60
[0/1]

WORD 4 Not Used Now

0 60
[0]

3. Record 2 - DATA IDENT FORMAT (8 words) Repeating

WORD 1

0 12 24 36 48 60
[Marsden Square | 1-Deg. Sq. No. | *Month | First Year | Last Year]

WORD 2

0 24 48 60
[Latitude | Longitude | 0000]

WORD 3 and 4

Not Used

0		60
		0

WORD 5

0		60
	Depth Meters	

WORD 6

Salinity or Sound Velocity

0	12	24	36	48	60
No. Obs.	Average	Maximum	Minimum	Std. Dev.	

WORD 7

Temperature Only

0	12	24	36	48	60
No. Obs.	Average	Maximum	Minimum	Std. Dev.	

WORD 8

Not Used

0		60
		0

NOTE: Words 5-8 repeat through all depths to EOR (variable length).
Record 2 repeats to EOF - each record for each 1-degree square.
Tape may contain more than 1 file. Format for each file same
as File 1 (Record 1, Record 2, etc.), End of Data - 2 EOFS.

Distribution: FNWF Inst. 5216.1

List I less E

List II, I

List IV, V, VI

List VII, C, D, E, F, M, N, O, P, Q, R, S, T, U, V

List IX, B

List X, B, C

List XI, B, E, G, H, K

List XII, G, J, M, N, P, S, V, X, Y, Z, C1, J1, K1, U1,

V1, X1, Z1, C2, E2, G2, H2